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United States Patent [19][11] **Patent Number:** **5,554,871****Yamashita et al.**[45] **Date of Patent:** **Sep. 10, 1996**[54] **SEMICONDUCTOR DEVICE HAVING MOS TRANSISTOR WITH NITROGEN DOPING**

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[75] **Inventors:** Tomohiro Yamashita; Satoshi Shimizu, both of Hyogo, Japan[73] **Assignee:** Mitsubishi Denki Kabushiki Kaisha, Tokyo, Japan[21] **Appl. No.:** 483,036[22] **Filed:** Jun. 7, 1995[30] **Foreign Application Priority Data**

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[51] **Int. Cl.⁶** H01L 27/088[52] **U.S. Cl.** 257/336; 257/344; 257/408; 257/410; 257/411; 257/900[58] **Field of Search** 257/408, 900, 257/336, 344, 410, 411[56] **References Cited****U.S. PATENT DOCUMENTS**

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Primary Examiner—William Mintel*Attorney, Agent, or Firm*—Lowe, Price, LeBlanc & Becker[57] **ABSTRACT**

An MOS transistor capable of improving hot carrier resistance and a method of manufacturing thereof are provided. In the MOS transistor, nitrogen is introduced in a sidewall oxide film, so that a concentration distribution of nitrogen in a section perpendicular to the main surface of a semiconductor substrate in the sidewall oxide film has a peak at the interface between the semiconductor substrate and the sidewall oxide film. As a result, an interface state at the interface between the sidewall oxide film and the main surface of the semiconductor substrate is suppressed, resulting in decrease of the probability at which hot carriers are trapped in the interface state. Accordingly, the hot carrier resistance is improved.

14 Claims, 32 Drawing Sheets